ATTACHMENT 1

REPAIR SYNCHRONOUS ROTORS

1. **Required:** Provide all engineering services, material, labor, tools, transportation, and test equipment required to repair and re-balance the synchronous rotors for the Ideal synchronous motors as described below. These rotors are from motors that drive dehumidification chillers in the ETF-C Plant.
2. **Past Performance:** The bidder shall document his ability to perform this type of work by providing examples of contracts where he has:
    a. Handled rotors of this size, approximately 8,000 pounds with a shaft approximately 12 feel long.
    b. Performed balancing on rotors of this size to requirements equal to or greater than those specified in the Statement of Work (SOW).
3. **Qualifications:** If the bidder has not performed rotor balancing of this type, he must:
    a. Provide the specifications of his balance machine
    b. Clearly explain how his machine can meet the requirements of the SOW
    c. Clearly explain how his personnel are capable of performing this type of balance (e.g. training, certification, etc.).
4. **Description of Repair:** The repair consists of removing the existing damaged upper coil supports, through bolts, and associated hardware and replacing them with new design Ideal Motor Company replacement parts as follows:
    a. Extruded upper coil supports.
    b. Extruded inner pole wedges.
    c. Inner pole studs, washers, and nuts.
    d. Through bolt/ upper coil support stud nuts, washers, and insulators.

    In addition, any loose rotor laminations shall be secured. The work includes pickup, delivery, and transportation from and to Arnold Air Force Base, Tennessee.
5. **Schedule**: Work on each rotor shall commence within 14 calendar days after notice to pickup the rotor. Two rotors, RC14.11 and RC13.12, are currently available for pickup at AEDC. The remaining three rotors will be made available one at a time. Availability of the third, fourth, and fifth rotors is as follows:
    a. Third rotor (RC3.2) availability date: October 1, 2004
    b. Fourth rotor (RC22) availability date: January 15, 2005
    c. Fifth rotor (RC12.1) availability date: April 15, 2005

    Availability of the third, fourth, and fifth rotors is dictated by the plant operations schedule, which is subject to change. Deviations to the availability dates of the third, fourth, and fifth rotors will be announced no later than two weeks before the dates listed above.
6. **AEDC Support**: AEDC will provide personnel and equipment to assist in loading the rotor on the contractor's truck and will provide assistance for unloading upon its return.

7. **Motor data**: Ideal Electric Company synchronous motor rotors

Motor ID	RC22.1	RC12.1	RC3.2	RC13.11	RC14.12
Horsepower	4,500	4,500	4,500	2,000	1,500
Stator Voltage	3-phase, 60 Hertz (Hz), 6,600 volts				
Stator full-load amps	303	303	303	135	102
Rotor Voltage	125 volts dc				
Rotor full-load amps	98.7	98.7	98.7	62.5	60
Power factor	1.0	1.0	1.0	1.0	1.0
RPM	1,800	1,800	1,800	1,800	1,800
Serial No.	304912	304913	304914	304932	304938
Frame	MC21129B	MC21129B	MC21129B	MC2808	MC2805
Type	SM	SM	SM	SM	SM

1. **Warranty Requirements**: The contractor shall warrant the work against defects in material and workmanship for one year after the rotor has been put into service based on our understanding of the industry standard warranty.

2. **Technical Surveillance**: ATA Systems Engineering will perform technical surveillance and provide the buyer with recommendations for acceptance or rejection of materials and work.

3. **Transportation**: Pickup, delivery, and transportation from and to Arnold Air Force Base, Tennessee are the responsibility of the contractor. AEDC has five wooden "cradles" for use in transporting/storing the rotors. The cradles shall be used at all times for transporting/storing rotors. At no time shall any rotor be rested on its poles. The AEDC shipping cradle shall not be altered or damaged in any way.

4. **Initial Electrical Tests:** Before a rotor is transported for refurbishment, electrical tests will be performed at AEDC by AEDC personnel to confirm the condition of the rotor winding following disassembly from the motor stator. The tests will include insulation resistance, polarization index, AC pole drop and DC winding resistance. Witness of this testing by the contractor is encouraged.

5. **Final Electrical Tests**: To ensure that the work performed on the coil supports and laminations has not adversely affected the rotor winding, the contractor will perform and record the following insulation and winding tests in accordance with IEEE 115-1995, Sections 3.1, 3.4.3, and 3.4.4. Perform the required tests before starting the work and again upon completion of the work. The AEDC representative shall witness the final tests (including balance). Before any testing, remove any accumulation of carbon dust and other contaminants by blowing with compressed air. Submit records of all electrical tests as part of the final test results.

    a. Insulation resistance and Polarization Index at 500 volts DC.

    b. Measure and record the rotor dc resistance, measuring through all poles and connections.

c. Perform an ac pole-drop test by applying an ac source voltage (120 volts AC) to the rotor collector rings. Measure and record the voltage across each individual rotor pole.

6. **Disassembly**: Remove the existing rotor balance weights. Remove the existing damaged upper coil supports and through bolts. Remove the support rings and fans. Check the shaft for straightness and notify the buyer if the shaft is found to be more than 0.002-inch out of straightness from one bearing journal to the other bearing journal. Turn the collector rings to have less than 0.002-inch eccentricity total indicator reading (TIR) with respect to the bearing journals and a finish of 32 root mean square (RMS) or better.

7. **Re-assembly:** Weigh the new upper coil support castings and install them as balanced pairs as far as is practicable. Replace the upper coil supports and through bolts with new design Ideal Motor Company upper coil supports and new through bolts. Replace the support rings. Machine all through bolt ends to provide a true surface for measuring bolt length. Tighten all bolts, including inter-pole wedge bolts to factory specifications. After the through bolts are torqued to specification, identify each through bolt and provide each actual bolt length dimension accurate to ± 0.001-inch to the buyer.

8. Secure any loose rotor laminations. Submit to the buyer the plan for securing the rotor laminations prior to doing work. Perform stage 2 balance detailed below.

9. Replace the rotor fans and perform stage 3 balance detailed below.

10. **Balance:** Step balance the rotor in the following stages of reassembly in accordance with the above guidelines. All balancing stages are to be dynamic and in a minimum of two planes. The rotor balance speed for stage 1 shall not exceed 300 rpm due to the partial assembly of the rotor. The balancing speed used for stages 2 and 3 shall be rapid enough so the balance machine sensitivity can reliably measure the maximum allowable residual unbalance. Dyna-weight® or similar "epoxy-type" balancing products shall not be used for final balancing on any stage. All balance weights used in stages 1 and 2 shall be secured to the rotor by welding – bolting alone is not sufficient. All balance weights used in stage 3 shall be secured using new self-locking nuts - lock washers are not allowed.

    For balancing stages 1 and 2, the maximum residual unbalance level allowed per plane is 15 oz-in. For balancing stage 3, the maximum residual unbalance level allowed per plane is 8 oz-in.

    Stage 1. Balance the rotating field after removing the fans, support rings, damaged upper coil supports, and the existing through bolts.

    Stage 2. Balance the rotor after installing new upper coil supports, new through bolts, and support rings.

    Stage 3. Perform final rotor balance after installing the rotor fans and painting. Any required balance weights shall be bolted to the fan blades in the holes provided. No more than three weights shall be stacked on one bolt.

    A formal residual unbalance test per API 546 C.4 and a balancing-machine sensitivity test per API 546 C.5 are required at the completion of the stage 3 balance. Final residual unbalance records of each balance stage and test are to be recorded and submitted with the final inspection/test report.

11. **Notification**: Notify the buyer at least two weeks in advance of performing final balancing and testing so that an AEDC representative may witness the tests.

12. **Submittals**: Submit the following information to the buyer for review.

    a. Full descriptions of the repair materials to be used prior to proceeding with the repairs.
    b. Certified shop test results for all the electrical tests upon the return of the rotor to AEDC.
    c. Results of all AEDC representative witnessed tests upon the return of the rotor to AEDC.
    d. Records of measured balance levels for each of the required balance stages and both stage 3 balance tests upon the return of the rotor to AEDC.
    e. The identifier for each through bolt and the actual bolt length accurate to ± 0.001-inch upon the return of the rotor to AEDC.

13. **AEDC Acceptance tests**: AEDC will perform the following acceptance tests upon return of the rotor. The repaired rotor is required to meet the following acceptance criteria as a condition of acceptance of the work performed.

    a. Insulation resistance greater than 2000 megohms and Polarization Index greater than 2.0.
    b. The dc resistance measuring through all poles and connections less than one ohm.
    c. An ac pole-drop test with the voltage drop across each individual rotor pole to within five percent or less.